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REMARKS/ARGUMENTS

Disposition of the Claims

In the Preliminary Amendment filed September 23, 2004, original Claims 1 to 11 were canceled and redrafted as newly submitted Claims 12 to 26 in order to place the claims in the proper format.

In the response to the Office Action dated July 27, 2005 that was filed October 31, 2005, Claims 12, 16, 23, 25 and 26 were amended. Claims 13, 15, 16, 24 and 26 were canceled. Claim 25 was amended to place the claim in independent form. Dependent Claim 27 was added. In the present response, Claim 27 has been amended to delete the phrase “, and wherein” since this phrase appears at the end of the sentence and as such does not make sense.

Accordingly, Claims 12, 14, 17 to 23, 25, and 27, as amended, are pending in the present application.

First U.S.C. § 103(a) Rejection

The Examiner has maintained the rejection of the claims under 35 U.S.C. § 103(a) as being unpatentable over Vonk et al, U.S. Patent No. 4,904,713 (hereinafter referred to as “Vonk et al”), in view of Agostinis et al, U.S. Patent No. 4,874,821 (hereinafter referred to as “Agostinis et al”). This rejection is respectfully traversed with regard to pending Claims 12, 14, 17 to 23, 25 and 27, as amended.

Claims 12, 14, 17 to 23, 25 and 27, as amended, are patentable over Vonk et al in view of Agostinis et al for a variety of reasons. First, Vonk et al fail to teach or suggest a bituminous composition that contains the block copolymer S₁-B₁-S₂-B₂ having a weight ratio of B₁ over B₂ from 3.0 to 12.0. Second, Agostinis et al, while teaching tetrablock copolymers, do not teach the polymer of the present invention. Third, Agostinis et al do not teach or suggest the use of tetrablock copolymers in bituminous compositions. Finally, even if one were to consider Vonk et al in view of Agostinis et al, the combined references do not teach or suggest the specific block copolymers of the present invention,

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the bituminous compositions of the present invention for use in a self adhesive shingle or roofing felt, or the coatings of the present invention.

The bituminous composition of the present invention comprises a bituminous component and a block copolymer of the general formula $S_1-B_1-S_2-B_2$ wherein S_1 and S_2 are monovinylaromatic hydrocarbon polymer blocks comprising at least 99 mole % styrene and B_1 and B_2 are conjugated diene polymer blocks comprising at least 80 mole% isoprene. In the copolymer of the present invention, the weight ratio of B_1 over B_2 must be in the range of 3.0 to 12.0. The present invention further comprises the block copolymer utilized in the bituminous composition, as well as a coating that comprises the bituminous composition described hereinbefore.

The Examiner has set out a large number of points regarding the present invention and the prior art cited by the Examiner. In an effort to advance prosecution, Applicants will seek to address each of these points on a point by point basis and explain in detail why the references cited by the Examiner fail to render the claims of the present application obvious.

Point 1:

With regard to independent Claim 12, the Examiner has noted that Vonk et al disclose the bituminous composition suitably in roofing coatings, comprising a bitumen, at least one elastomeric, optionally hydrogenated, block copolymer of an alkenyl arene and a conjugated diene, and a polymer of a monoalkenyl arene.

Applicants do not dispute this statement since it was taken directly from Vonk et al.

Point 2:

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The Examiner has also noted that with regard to the formula $S_1-B_1-S_2-B_2$ of Claim 12, Vonk et al disclose that additional A and/or B blocks may be alternatively grown via sequential addition of the respective monomer to product a linear polymer.

Applicants acknowledge that Column 4, lines 1 to 4 of Vonk et al do make this statement. However, while Vonk et al arguably imply that additional blocks can be present, Vonk et al do not suggest that if a tetrablock polymer of the formula $S_1-B_1-S_2-B_2$ having a weight ratio of B_1 over B_2 from 3.0 to 12.0 is used in bituminous compositions, it is possible to achieve a good balance of adhesive properties and rheological performance for these bituminous compositions. A generic disclosure that there could be an additional block in the copolymer thereby implying that there can be a copolymer having 4, 5, 6, 7, etc. blocks does not teach or even suggest the specific block copolymer claimed by Applicants that achieves specific improvements over the block copolymers of the prior art. Vonk et al do not disclose the combination of the two essential components of the present invention: (1) a tetrablock of the formula $S_1-B_1-S_2-B_2$ and (2) a weight ratio of conjugated diene block B_1 over B_2 from 3.0 to 12.0. In order for Vonk et al to render the present invention obvious, there must be some teaching or suggestion in Vonk et al of tetrablock copolymers of the formula $S_1-B_1-S_2-B_2$ having such a ratio. Therefore, absent such a teaching or suggestion, it cannot be said that Vonk et al, considered alone, renders the pending claims of the present application obvious.

Point 3:

Third, the Examiner has further noted that with regard to Claim 12, the weight average molecular weight of monovinylaromatic hydrocarbon in the block copolymer ranges from 12,000 to 40,000 and its content is from 10 to 35 wt% of the block copolymer. The Examiner has also noted that Vonk et al disclose that polymeric blocks A preferably have a number average molecular weight of 5,000 to 50,000 and preferably that the proportion of the polymeric blocks A in the block copolymer is from 10 to 60 wt%.

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Applicants do not dispute that there is an overlap with regard to these ranges. However, this does not overcome the fact that Vonk et al do not teach or suggest that tetrablock copolymers of the formula claimed by Applicants having a ratio of B_1 to B_2 in the range claimed by Applicants is necessary in order to obtain the specific improvements achieved by Applicants.

Point 4:

Next, the Examiner has noted that the S_1 and S_2 blocks of Claim 12 comprise at least 99 mol% of styrene and that Vonk et al disclose that their A blocks will contain at least 99 mol % of styrene when block A is a homopolymer of styrene.

Again, Applicants do not dispute this, but point out once again that this does not overcome the insufficiencies of Vonk et al since Vonk et al fail to teach or suggest tetrablock copolymers of the formula claimed by Applicants having a ratio of B_1 to B_2 in the range claimed by Applicants.

Point 5:

The Examiner has also indicated that in Claim 12, Applicants claim (1) that the apparent molecular weight of B_1 is from 180,000 to 400,000 and for B_2 is from 15,000 to 60,000; and (2) that both conjugated diene blocks comprise at least 50 mol % of isoprene, while Vonk et al disclose that the polydiene block (or blocks) B has (have) preferably a number average molecular weight of 15,000 to 350,000, and that this range overlaps with that claimed in Claim 12. In addition, the Examiner has noted that Vonk et al disclose that the blocks B may comprise homopolymers of conjugated diene monomers or copolymers of two or more conjugated dienes with the preferred conjugated dienes being butadiene and isoprene. The Examiner has then noted that the conjugated diene blocks of Vonk et al will have more than 50 mol% of isoprene as the B block is a homopolymer of isoprene.

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Applicants note for the record that in Claim 12, the mole % of isoprene in B₁ and B₂ is at least 80. Otherwise, with regard to the Examiners comments, Applicants do not dispute these but again point out that they do not overcome the insufficiencies of Vonk et al.

Point 6:

The Examiner has indicated that in Claim 12, the B₁ and B₂ blocks comprise at least 80 mol% isoprene and that Vonk et al disclose that the block B may comprise a homopolymer of conjugated diene monomers, or copolymer of two or more conjugated diene monomers and therefore that the polydiene blocks of Vonk et al will contain at least 80 mol% of isoprene when the isoprene is selected as the predominate block.

Once again, Applicants do not dispute this fact but again point out that this does not overcome the insufficiencies of Vonk et al noted previously.

Point 7:

In the seventh point, the Examiner has indicated that Vonk et al do not disclose the weight ratio of conjugated diene block B₁ over B₂ ranging from 3.0 to 12.0.

Applicants completely agree with this point and further point out that while Vonk et al imply that multiblock copolymers can be used in bituminous compositions, one skilled in the art would never conclude from reading Vonk et al that by using a tetrablock copolymer of the formula S₁-B₁-S₂-B₂ wherein the ratio of B₁ over B₂ ranges from 3.0 to 12.0 it would be possible to obtain advantageous high and low temperature properties which are maintained over time.

Point 8:

With regard to Agostinis et al the Examiner has noted that in Agostinis et al, the weight ratio of the two polydienic blocks is in a relation so that the weight of one polydienic block (B₁) will be the weight of the other polydienic block (B₂) times a value

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from 0.1 to 0.5 or the weight ratio for the two polydienic block will range from 2.0 to 10.0.

Agostinis et al teach a tetrablock copolymer having two styrene blocks, A1 and A2, and two polybutadiene blocks, B1 and B2, wherein the A1 block is from one quarter to two times the size of the A2 block and wherein the B1 block is from one tenth to one half the size of the B2 block. Agostinis et al disclose that the B1 and B2 blocks are "polydienic blocks" but limit their discussion, including the examples, to polybutadiene blocks. There is no specific mention of isoprene. In addition, the examples and results presented by Agostinis et al are those typically measured for hot melt adhesive compositions, not for bituminous compositions to be utilized in roofing applications. While the background of Agostinis et al does make a general reference to the use of block copolymers in bitumens (see specifically column 1, lines 19 to 28 where it is noted that the living polymer technique makes it possible to prepare linear and branched block copolymers and that these block copolymers are widely used in adhesives, in compositions with bitumens, in compositions with several plastic materials, in the field of footwear, and so forth), Agostinis et al do not teach or suggest that the polymers of Agostinis et al can be used in bituminous compositions with the expectation of achieving good properties. The section referred to above has nothing to do with the polymers of Agostinis et al except that it lays out the prior art or background noting that linear and branched block copolymers have been prepared by living polymer techniques, that such polymers have been disclosed in a variety of patents and that they have been used in a variety of manners. There is no suggestion that the polymers of Agostinis et al will work in every application noted in the background.

As already admitted by the examiner, Vonk et al do not use the specific polymer claimed by Applicants (S_1 - B_1 - S_2 - B_2 wherein the weight ratio of B_1 over B_2 is from 3.0 to 12.0). Therefore, it is necessary for the Examiner to rely on a secondary reference in order to meet the requirements for an appropriate 35 U.S.C. § 103 rejection. In order to constitute a proper 35 U.S.C. § 103 rejection, there must be some motivation to combine

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the cited references. A general relationship between the fields of the prior art references to be combined is not sufficient to suggest the motivation. Applicants maintain that the statement made in the background of Agostinis et al merely indicates that there are a variety of uses for block copolymers and cannot be taken to mean that any time a block copolymer is used in an adhesive, it automatically will provide advantages for a bituminous composition. Simply because a polymer gives good performance in traditional adhesives, it does not necessarily follow that this polymer will also work as well, or better, in other utilities such as for example, bituminous compositions for roofing applications. The disclosure by Agostinis et al can only be taken as an invitation to try. Accordingly, since Agostinis et al do not specifically teach or suggest that the block copolymers of Agostinis et al can be used in bituminous compositions, there is no motivation for the skilled artisan to utilize block copolymers such as those claimed by Applicants in a formulation such as that disclosed by Vonk et al. Applicants maintain that since Agostinis et al fail to teach or even suggest that the block copolymers of Agostinis et al can be utilized in bituminous compositions such as those of Vonk et al, it cannot be said that Vonk et al, in view of Agostinis et al, renders the pending claims of the present application obvious.

Applicants further note that the block copolymer of the present application is not obvious when considered in light of Vonk et al in view of Agostinis et al. Agostinis et al provide in column 3, lines 24 to 34 "...in a first step of polymerization, metered amounts of butadiene and styrene, mixed together, are fed, and are polymerized in solution, with a suitable catalytic system for the synthesis of the living polymers, up to a complete, or substantially complete, conversion of the monomers; in this way, a living copolymer is formed, which is constituted by two not-pure B1-A1 blocks, i.e., which are linked with each other by a copolymeric chain constituted by randomly linked monomeric units of butadiene and styrene". Accordingly, the first step does not result in two pure B1-A1 blocks. In the process of the present invention, the polymers are made by full sequential polymerization (see General Procedure for the Preparation of Polymer A, page 11 of the present application). The monovinylaromatic hydrocarbon (styrene) is polymerized first

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up to completion. Isoprene is added next and allowed to react until completion. Then a second portion of styrene is added and reacted until completion followed by a final portion of isoprene. This process does not result in the formation of "not pure B1-A1" blocks as in Agostinis et al. Accordingly, it is not obvious to replace the first step of Agostinis et al to come up with the process utilized to achieve the specific block copolymers of the present invention which exhibit properties which make them useful for bituminous compositions.

Point 9:

Furthermore, the Examiner, citing Agostinis et al, has indicated that the advantage of using block copolymers consisting of linear alternating polydienic and polyvinylaromatic blocks, having a particular structure and distribution of the individual blocks is the unexpectedly good balance of characteristics between mechanical characteristics and thermooxidation resistance.

Applicants maintain that since the testing utilized in the Agostinis et al patent is limited to tests utilized for adhesives, one skilled in the art would merely conclude that the characteristics referred to by Agostinis et al were also limited to standard adhesives.

Point 10:

The Examiner has also noted that Agostinis et al at Col. 2, lines 57 to 61 has indicated that the advantages of using a copolymer having butadiene/isoprene as the poydienic block are the same advantages, or similar advantages, to those achieved when butadiene is replaced by other dienic monomers.

Applicants maintain that even if one skilled in the art were led by this statement to utilize a conjugated diene block that contains at least 80 mole% isoprene, Vonk et al in view of Agostinis et al still does not render the present claims unpatentable since there is still no teaching or suggestion that would motivate one skilled in the art to use the

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polymers of Agostinis et al in the manner that Vonk et al utilizes the polymers disclosed in Vonk et al, in bituminous compositions.

Point 11:

Next the Examiner has indicated that it would have been obvious at the time of applicants invention to include a weight ratio of two types of polydienic blocks of Agostinis et al in the block copolymer of the bituminous mixture disclosed by Vonk et al because it will achieve the aforementioned advantages.

Applicants respectfully strongly disagree with this statement since there is no teaching or suggestion in either Vonk et al or Agostinis et al that the results achieved by Applicants could be achieved by substituting the modified polymers of Agostinis et al (to meet the requirement of at least 80 mole % isoprene) in the bituminous composition of Vonk et al. There would have to be a suggestion in Agostinis et al that advantages can be achieved using tetrablock polymers having diene blocks that contain a substantial amount of isoprene in bituminous compositions. There is no such suggestion.

Point 12:

Furthermore, the Examiner has indicated that with regard to Claim 14 of the present application, Vonk et al disclose that the block B may comprise a homopolymer of conjugated diene monomers or copolymer of two or more conjugated diene monomers (the polydiene blocks of Vonk et al will contain at least 99 mole% of isoprene when the isoprene is selected to predominate the block).

Applicants do not dispute this fact but note that this does not overcome the deficiencies of Vonk et al or Agostinis et al.

Point 13:

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The Examiner has also rejected claims 17 to 22 under 35 U.S.C. § 103(a) as being unpatentable over the Vonk et al, in view of Agostinis et al for the same rationale in the prior office action dated July 27, 2005.

Applicants maintain that Claims 17 to 22, as amended, are patentable over Vonk et al in view of Agostinis et al for the same reasons noted above.

Point 14:

The Examiner has noted that with regard to the limitation of block copolymer in independent claim 23, the disclosure of Vonk et al and Agostinis et al are incorporated herein by reference. The subject matter of the block copolymer composition in the applicants claim 23 has been recited in applicants claim 12 and has been discussed in paragraph 3.

Applicants repeat the argument made above with regard to the block copolymer of the present application and note that Claim 23 is not obvious when considered in light of Vonk et al in view of Agostinis et al. Agostinis et al disclose a polymer in which the B1-A1 blocks are not pure B1-A1 blocks. The block copolymer of the present invention is made by full sequential polymerization wherein the first step involves the monovinylaromatic hydrocarbon (styrene) being polymerized up to completion. Isoprene is added next and allowed to react until completion. Then a second portion of styrene is added and reacted until completion followed by a final portion of isoprene. This process does not result in the formation of "not pure B1-A1" blocks as in Agostinis et al. Accordingly, the block copolymers differ and Applicants maintain that it would not have been obvious to one skilled in the art make the necessary modifications to achieve the polymer of the present invention with the expectation that it would give advantages when utilized in bituminous compositions. Neither Vonk et al or Agostinis et al, whether considered alone or in combination, would lead one skilled in the art to the present polymer for use in a bituminous composition.

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Point 15:

The Examiner has indicated that with regard to Claim 25, the disclosure of Vonk et al and Agostinis et al are incorporated herein by reference. The subject matter of the bituminous composition in the applicants Claim 25 has been recited in applicants claim 12 and has been discussed in paragraph 3.

Applicants maintain that the same arguments made above are applicable with regard to Claim 25.

Point 16:

The Examiner has further noted with regard to Claim 25, that Vonk et al disclose a bituminous composition especially suitable in roofing coatings.

Applicants do not dispute this fact but maintain that this fact does not overcome the deficiencies of Vonk et al and Agostinis et al with regard to Claim 25.

Point 17:

In the final point, the Examiner has indicated that with regard to the limitation of dependent Claim 27, the disclosure of Vonk et al and Agostinis et al is incorporated herein by reference, and that the B₁ and B₂ blocks comprising 99 mol% isoprene independently, with the ratio of W to be 4.0 to 8.0, polymer block B₁ having an apparent molecular weight of from 250,000 to 350,000, polymer blocks S₁ and S₂ having a molecular weight of from 20,000 to 35,000 independently has been recited in a broader scope in the applicants claim and has been discussed in paragraph 3.

Applicants maintain that the same arguments made above are applicable with regard to Claim 27.

Conclusion:

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Vonk et al do not teach the polymer of the present invention: a $S_1-B_1-S_2-B_2$ polymer in which the weight ratio of B_1 over B_2 is from 3.0 to 12.0. Agostinis et al, teaches a tetrablock polymer for use in adhesives that has a B_1 to B_2 weight ratio that arguably overlaps with the range claimed by Applicants. However, Agostinis et al fail to suggest that such polymers would give advantages in bituminous compositions. Agostinis et al only make a generic statement in the background regarding block copolymers in general and their use in multiple areas including bitumens. Agostinis et al do not state that the polymers of Agostinis et al can be used advantageously in all areas. Since there is no motivation for the skilled artisan to utilize block copolymers such as those claimed by Applicants in a composition such as that disclosed by Vonk et al, it cannot be said that the claims of the present application are obvious. More specifically, since Agostinis et al fail to teach or even suggest that block copolymers such as those of Agostinis et al can be utilized in bituminous compositions such as those of Vonk et al, it cannot be said that Vonk et al, in view of Agostinis et al, renders the pending claims of the present application obvious.

In view of the above, Applicants respectfully request that the rejection of Claims 12, 14, 17 to 23, 25 and 27, as amended, under 35 U.S.C. § 103(a) as being unpatentable over Vonk et al in view of Agostinis et al, be withdrawn.

Respectfully submitted,

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By 

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